Tivoli Backup and Restore Services for Open Systems

Product Summary

ITS owns and maintains an IBM Tivoli Storage Manager (TSM) backup and restore environment in the Salt Lake City and Richfield data centers. This environment is available for State agencies for the following applications:

- Open Systems servers hosted in the Salt Lake City or Richfield data centers.
- Open Systems servers with State of Utah WAN connectivity that are hosted at agency sites outside the Salt Lake City and Richfield data centers.

Description of Services

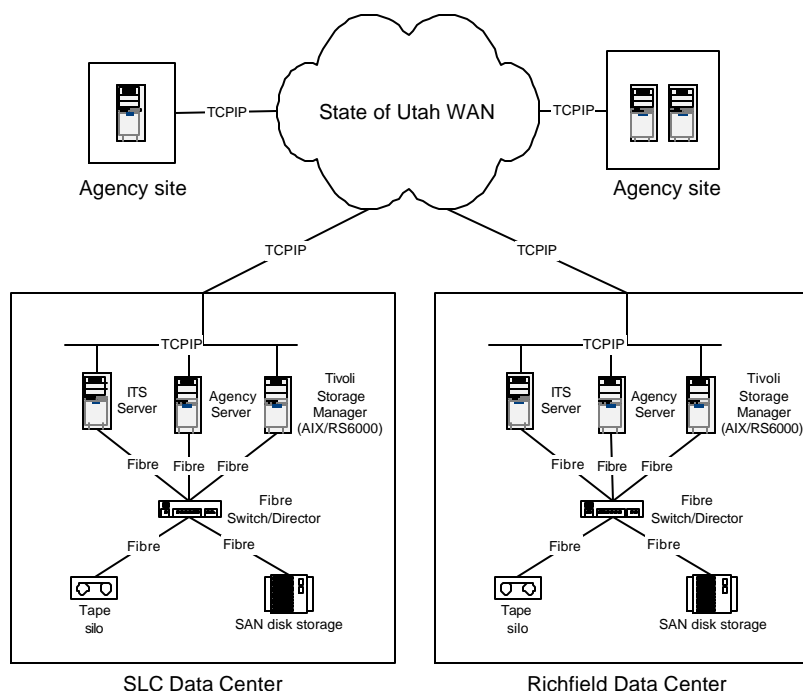The ITS Tivoli backup and restore environment is represented in Figure 1.

Figure 1. ITS Tivoli Storage Manager Environment

Disk and tape storage space in the ITS Tivoli environment is currently provided by IBM 2105 Enterprise Storage Servers™ (ESS) and by StorageTek T9840 tape drives running in StorageTek PowderHorn tape silos.

TCP/IP connectivity is used from file servers to the Tivoli server. The Tivoli server is attached to the SAN disk and tape environment via Fibre Channel.

Product Benefits

Benefits	
IBM Tivoli Storage Manager	• Enterprise storage management solution providing automated, unattended backups. • Supports a broad range of client and file server platforms. • Robust administrator capabilities to manage the TSM server from any TSM client platform. • Easy-to-use Web interfaces for daily administrative and user tasks. • Extensive storage device support. • Robust server database. • Online, incremental backup and recovery for Oracle, Informix, and other DB types. • Compression to reduce network traffic, transmission time, and TSM server storage requirements. • Multitasking capability—multiple TSM client sessions. • Online and offline database backup and archive support. • Open API providing critical online backup services to data-intensive applications. • Incremental backups are all that are ever needed (no full backups except for the first backup).
ITS Data Center	• Climate controlled environment. • Physically secure environment. • 24x7 monitoring of systems. • Tier 3 Data Center providing managed redundancy for power generation systems and uninterruptible power sources with battery backup.

IBM TSM Overview

IBM's Tivoli Storage Manager is an enterprise-wide storage management application that utilizes the network. TSM provides automated, centrally scheduled, policy-managed backup services for file-servers. TSM supports multi-vendor servers of various sizes and operating systems, which are connected via WAN, LAN, and SAN. TSM fits virtually all of today's heterogeneous network environments with extensive platform capability and ensures data integrity through consistent policy management, thus reducing a customers' time and system resource requirements.

TSM is a "transaction" oriented backup system. The main philosophy behind TSM is to only backup "changed" data. Upon initial backup with TSM, the product proceeds with a "full" backup of the clients' data. The subsequent backup sessions are incremental in nature and only "changed" data is backed-up. TSM tracks data in a RDBMS database. This reduces traffic on the network and disk and tape resource usage. Based on TSM policies, the TSM server stores client files on disk or tape volumes in data storage. The TSM data storage is allocated, defined, and grouped into storage pools (see *Configuration Options* below.)

TSM backs up and restores application data files only. Tivoli does not support "bare-metal" restore of the client's operating system. Performing a bare-metal restore involves the following process:

- Restoration of the OS environment via platform-specific utilities (Ghost, MKSYSB, Ignite, etc.).
- Re-application of OS patches.
- Re-installation and configuration of the applicable TSM backup and archive client software.
- Data restoration via TSM over the network.

ITS and Customer Responsibilities

Administration of the Tivoli environment is accomplished by a team of two:

- The TSM Server Administrator (ITS)
- The client Server Administrator (customer)

(See Figure 2.) The partnership between these two administrators helps ensure that data is managed according to the needs of the customer agency.

TSM Server Administration (ITS Staff)

The TSM servers in the ITS data centers are centrally managed by a TSM Administrator. The duties of the TSM Server Administrator include:

- Manage the overall enterprise Tivoli environment.
- Provide orientation materials for client Server Administrators.
- Define and manage storage pools.
- Work with customer client Server Administrators to define and manage backup and restore policies for individual servers.
- Provide 24x7 support for issues encountered by client Server Administrators during data restores.
- Notify client Server Administrators of missed or failed backups.
- Provide other assistance and/or consultation as needed.

Customer Client Server Administration (Customer or ITS Staff)

The customer client Server Administrator the steward of the data managed by individual servers. This administrator is identified when Tivoli services are first ordered. This person understands the data and understands the business needs of the customer agency. As a result, Tivoli administration on client servers that are being backed up via TSM is usually managed by the System Administrator for that server. This System Administrator is normally a staff member of the customer agency.

However, if an agency has contracted with ITS to provide system administration (or Tivoli administration duties) for a specific server, then ITS staff will perform Tivoli administration on that server.

If the System Administrator for the client server is a different person than the one who manages applications on the server, the System Administrator and Application Manager must work together to ensure that backup policies for the machine are appropriate for the application. For instance, if the server is a database server where one person administers the hardware and operating system and another person administers the database, these two people should work together to ensure that backup policies meet the needs of the database on that server.

Client server administration duties include the following:

- Learn and understand how to perform Tivoli client server administration tasks.
- Installation and customization of the backup and archive client software on the client server.
- Work with the ITS TSM Server Administrator to define and manage backup and restore policies.
- Work with the person who manages applications on the client server to ensure backup policy definitions are appropriate for the application.
- Create and manage client server-specific include and exclude lists.
- Work with the ITS TSM Server Administrator to do backup and restore performance tests.
- Monitor whether backups were successful and whether the correct data was backed up.
- Take action to correct missed or failed backups. (The ITS TSM Server Administrator is available for assistance.)
- Manage data restores. (The ITS TSM Server Administrator is available for assistance.)

Client Server Administrator Tools

The Tivoli administration tool for client servers is a backup and archive software client utility that is installed on the server. This utility is provided to the customer by ITS and has the following interfaces for administration duties:

- A software GUI for most operating system platforms.
- A command-line interface.
- An API.
- A Web-based interface that can be used to access administration tools from remote PCs.
- ITS does not currently support the archive features of the client utilities.
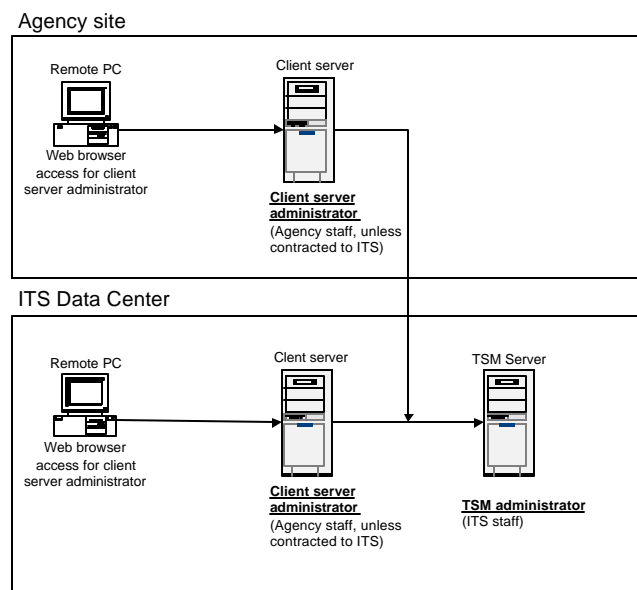

Figure 2. Division of administrative responsibilities

Configuration Options

Data backed up with TSM is stored in storage pools. A storage pool defines physically where the backups are stored. In the ITS Tivoli environment there are three storage pool options (see Figure 3):

- **Option 1: One primary backup pool.** The primary backup pool resides on tape in the primary data center.
- **Option 2: One primary backup pool and one remote copy pool.** The primary backup pool resides on tape in the primary data center. The remote copy pool stores data offsite for disaster recovery-type scenarios.
- **Option 3: One primary backup pool, one local copy pool, and one remote copy pool.** Both the primary backup pool and local copy pool reside on tape in the primary data center. The local copy pool provides a complete copy of the data in the primary backup pool in case of a tape failure in the primary backup pool. The remote copy pool stores data offsite for disaster recovery-type scenarios.

As backup data streams into the TSM server over the network, backup data is stored temporarily on SAN disk storage. This temporary storage is spooled off to the primary and/or copy pools during production hours the next day.

The customer and ITS will work together to determine which configuration option best suits customer needs. Costs are important to consider in making this determination. For instance, Options 2 and 3 respectively use two and three times as much storage space as Option 1. Since fees for *Tivoli Backup and Restore Services* are based on a per megabyte rate, Options 2 and 3 are therefore more expensive — although they provide a higher level of backup protection.

Choosing a Primary Data Center for Backups

When a server is configured for backups via the ITS TSM environment, the TSM Server Administrator chooses one of the ITS data centers as the "primary data center." The primary data center is the data center where the TSM server resides. Local storage pools are located in the primary data center. If Salt Lake City is chosen as the primary data center, then the remote pool is located in Richfield. If Richfield is chosen as the primary data center, then the remote pool is located in Salt Lake City.

Depending on customer need, agencies may request either Salt Lake City or Richfield as the primary data center for backups. Typically the physically closest data center is preferred for faster backup and restore times, but ITS will work with the agency to determine which data center best fits agency needs.

Backup Policies

TSM backup policies control how backups are done. These policies control how long files are kept and where they are stored.

Backup policies govern parameters such as:

- Which files and directories are backed up.
- Where files can be stored.
- How many days must elapse before a file can be backed up again.
- How to handle files that are in use during backup.
- Where the server stores backup versions of files and directories.
- How many backup versions the server keeps of changed files and directories.
- How long the server keeps backup versions of files and directories.

A file is considered for backup only if it has changed since the last backup. The file is considered changed if the date on which the file was last modified is changed, the file size has changed, the file owner is changed, or the file permission has changed.

A list of ITS TSM standard backup policies can be obtained from the TSM Server Administrator. Customized policies can be created where needed based on application-specific needs.
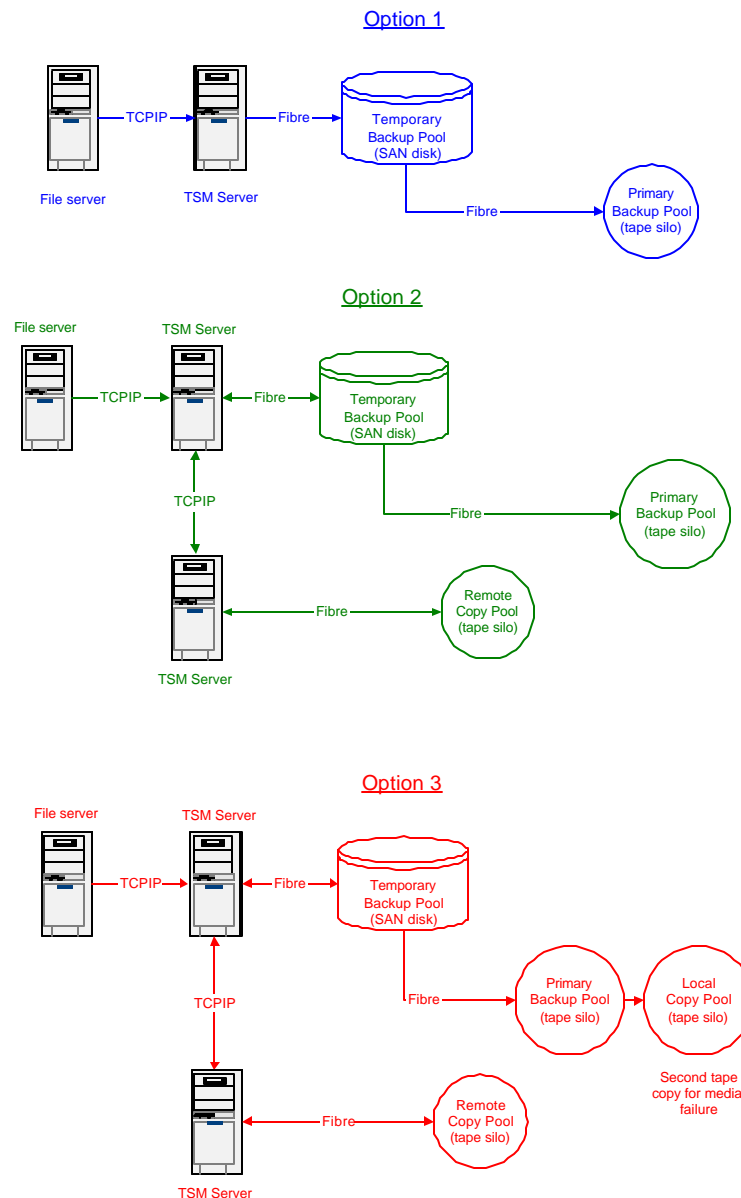

Figure 3. Storage pool options

TSM and Databases

If the client server being backed up is a database server, Tivoli can be used to do cold back ups of the database. "Hot backups" are also possible by using additional software called Tivoli data protection agents. These agents have various database-specific dependencies and require:

- Additional licensing fees which are paid for by the customer agency.
- Expertise on the part of the customer agency in using these agents.

Database Administrators can use several techniques to back up databases with TSM. These techniques use either the operating system utilities, the RDBMS utilities, or either of these combined with TSM. There are nearly two hundred various Redbooks available from IBM on how to set up backups to benefit the needs of an application, all available online at:

http://publib-b.boulder.ibm.com/cgi-bin/searchsite.cgi?query=tivoli

TSM by itself supports only data files and sparse files, but when used in conjunction with user programs or RDBMS utilities, TSM supports RDBMS objects and Raw devices along with data and sparse files.

Product Service Levels

Because the network connection between the TSM server and the client server effects the performance of backups and restores, it is important for ITS and the customer agency to establish "level of service" expectations before backup services are put into production.

Before backups for a new customer agency are put into production, a full backup and restore test will be performed. Timing for this test will be coordinated between the customer agency and ITS. The client server administrator must be able to devote sufficient time to help make this test happen.

If backup and restore performance is satisfactory to ITS and the customer agency, the backups for that customer will be put into production after a business agreement between ITS and the customer agency is put into place.

Training

Because State agency Client Server Administrators provide some of the Tivoli administration functions, ITS will help ensure that these Client Server Administrators are provided with informational material that includes helpful hints and tips on configuration of the TSM client software, as well as information on where to obtain more formal training.

ITS Customer Support

ITS Customer Support provides help to address technical problems related to Tivoli Backup and Restore Services for Open Systems. Response to any Help Desk trouble ticket will be within the specified parameters as described below:

ITS Customer Support
Problem resolution is managed through industry best practices using a Tiered Support Process.
Problem priority is based on the importance of the system affected, the severity of system degradation, and the number of affected users.

ITS Customer Support
Problems can be submitted 24x7 via phone or Web.
Web submissions are monitored during normal business hours (M-F 7:30 a.m. to 5:30 p.m.).
Response to submitted problems is two business hours for low and medium priorities, one clock hour for high priorities, and, thirty clock minutes for urgent priorities.
Response to escalated problem submissions not resolved by Help Desk/Tier 1 is within two business hours for low and medium priorities, one clock hour for high priorities, and, thirty clock minutes for urgent priorities.
Target problem resolution is two business days for low and medium priorities, eight business hours for high priorities, and two business hours for urgent priorities.
Resolution performance and escalation performance are measured regularly.
Customer satisfaction is measured regularly.
Outage reports are provided to communicate lessons learned and to explain future preventative measures.

System Requirements

IBM's TSM supports the following operating systems:

- Hewlett-Packard HP-UX
- IBM AIX
- IBM OS/390 UNIX System Services
- Linux
- Microsoft Windows 32-bit Intel for Windows XP / NT / Me / 2000 / 98 / 95
- Novell NetWare
- Sun Solaris
- Others (Contact ITS)

Servers being backed up via Tivoli must be connected to the State of Utah WAN. Because TSM is a network backup product, the larger the links between client server and TSM server, the faster the data will be backed up and restored. The size and throughput of the network or WAN connection between the client server and the TSM server, therefore, has a dramatic effect on the throughput that can be achieved.

ITS uses the TCP/IP protocol for all TSM data communications.

Related ITS Products

Related ITS Products	
Raw Enterprise Disk Storage	ITS owns and maintains a highly available SAN storage environment in the Salt Lake City and Richfield data centers. *Raw Enterprise Disk Storage* is available for use by State agency-owned Open Systems servers hosted in the Salt Lake or Richfield data centers.
Server Administration	$150/month – Unix $225/month – Windows NT

Product Rate

Rates	
Billable Item	**Rate[1]**
Tivoli Backup and Restore Services for Open Systems	$0.0025/MB/month

Product Agreement

ITS and the Customer agree that this Product Description together with an approved Product Order Form constitute a binding agreement between both parties for the Product and related services required by the Customer. This Agreement remains in effect according to the terms specified in the Product Order Form.

Product and/or Service Rates listed are in accordance with the approved ITS Rate Schedules. Therefore, the product description and order form replaces all other documentation, i.e., Contracts, Special Billing Agreements (SBA), Service Level Agreements (SLA), Memorandums of Understanding (MOU), etc.

To the extent that the terms set forth above conflict with an existing Contract, Special Billing Agreement (SBA), Service Level Agreements (SLA), Memorandums of Understanding (MOU), or other agreement between ITS and the customer, the parties acknowledge that the foregoing shall supercede the earlier agreement.

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[1] Effective November 1, 2003